

**Instructions to Supervisors for the Unit 3 Practical Examination**

**CONFIDENTIAL**

**OPEN ON RECEIPT**

The examination will be held on Wednesday 16 May 2007 1.30 pm to 3.15 pm

- These *Instructions* are provided to enable centres to make appropriate arrangements for the examination. Copies of the *Instructions* are to be kept at the centre under lock and key when not in use; they are not to be removed from the centre. The question paper packets must not be opened prior to the examination.
- These Instructions explain how to set up the equipment for Question 2.
- Relevant parts of Question 2 are printed on page 4 of this Instruction booklet.
- Centres are at liberty to make any reasonable minor modifications to the apparatus which may be required for the successful working of the experiment but a note of all such modifications must be forwarded to the Examiner with the candidates' scripts. However, any such modifications must permit the experiment to be carried out in the specified manner.

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## INSTRUCTIONS TO THE SUPERVISOR OF THE PRACTICAL EXERCISES

### Preparing for the Practical Examination

- 1 The instructions and details of materials contained in this document are for the use of the Supervisor and are strictly confidential. After use, these *Instructions* must be kept in safe custody by the Examinations Officer until after the issue of results (in March or August as appropriate).
- 2 The Supervisor has been granted access to some of the questions to aid the practical set up as part of these *Instructions*. The relevant questions are printed to enable the Supervisor to carry out the experimental parts of the Exercises in order to ensure that the apparatus and materials obtained are satisfactory and to seek advice from AQA if there are any problems. The remaining questions for this examination are not provided in these *Instructions* as it is not necessary for the Supervisor to be aware of the questions as they have no bearing on the setting up of the equipment. The *Instructions* must be returned to safe custody at the earliest possible moment after the Supervisor has ensured that all is in order.

### The Practical Examination

- 1 If a candidate is unable to perform the experiment, or is not performing it safely, the Supervisor is expected to give the minimum help required to enable the candidate to proceed. In this instance, a note bearing the candidate's name and number must be attached to the candidate's script reporting to the Examiner the extent of the help given. Any failure in the apparatus should also be reported to the Examiner. No help should be given with the analysis of the experimental data.

It is not the wish of the Examiner that a candidate should waste time because of, for example, an incorrect electrical connection. The Examiner wishes to test the candidate's ability to perform an experiment and carry out the subsequent analysis.

- 2 Details should be given to the Examiner if the apparatus or materials provided differ from those detailed in these *Instructions*. Where specific information or data about apparatus or materials is requested in these *Instructions*, it is important that it is given accurately. In some cases it may represent the only means available to the Examiner of assessing the accuracy of a candidate's work.

In case of difficulty the Supervisor should telephone the Senior Subject Officer for A Level Physics, David Baker, at AQA (Manchester Office), telephone number 0161 953 1180, or email [dbaker@aqa.org.uk](mailto:dbaker@aqa.org.uk)

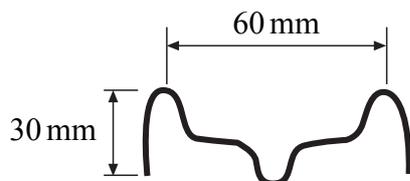
Candidates will investigate the extension of a spring-mass system of variable stiffness.

**Apparatus required for each candidate:**

- seven expendable steel springs of similar stiffness, e.g. Philip Harris, 2006 catalogue C6A41397 (pack of 100)
- metre ruler
- set square
- retort stand, boss and clamp (to hold the metre ruler)
- retort stand, boss, rod or clamp to serve as horizontal support for spring-mass system
- G-clamp to stabilize base of retort stand
- about 15 to 20 cm of stiff wire or large paper clip to fashion lower part of spring-mass suspension
- mass hanger of mass 50 g or 100 g and nine additional 100 g slotted masses to make combined mass of 950 g or 1000 g
- about 50 cm of strong thread or string
- short length of insulation tape or similar

The general arrangement of the apparatus is shown in **Figure 2** on the question paper (see page 4 of these *Instructions*). The boss is fixed close to the base of the rod of the retort stand and the horizontal support projects from the rod in a direction perpendicular to the edge of the desk. It is suggested that a G-clamp is used to ensure that the arrangement is stable.

Produce two sets of three coupled springs then arrange these together with the remaining spring as shown in **Figure 2** (page 4 of these *Instructions*). The lower part of the assembly can be constructed from stiff wire or from a large paper clip. The shape and dimensions of this part are shown below.



Connect the two sets of coupled springs to this part of the assembly and then adjust the points of suspension at the top of the assembly until both sets of coupled springs are vertical. Position the single spring so that it hangs from a point mid-way between the two sets of coupled springs. Use a piece of insulation tape or similar to ensure that the positions of the springs on the horizontal support do not move.

Tie the thread between the bottom of the single spring and the hook of the mass hanger so that the length of thread between them is between 35 and 40 cm. Finally attach the mass hanger to the assembly to produce the arrangement shown in **Figure 2** (page 4 of these *Instructions*).

The nine masses, metre ruler and set square should be placed on the desk alongside the apparatus. Adjust the height of the boss so that when the maximum load is applied and the system is at rest, the vertical distance between the bottom of the mass hanger and the floor is approximately 300 mm.

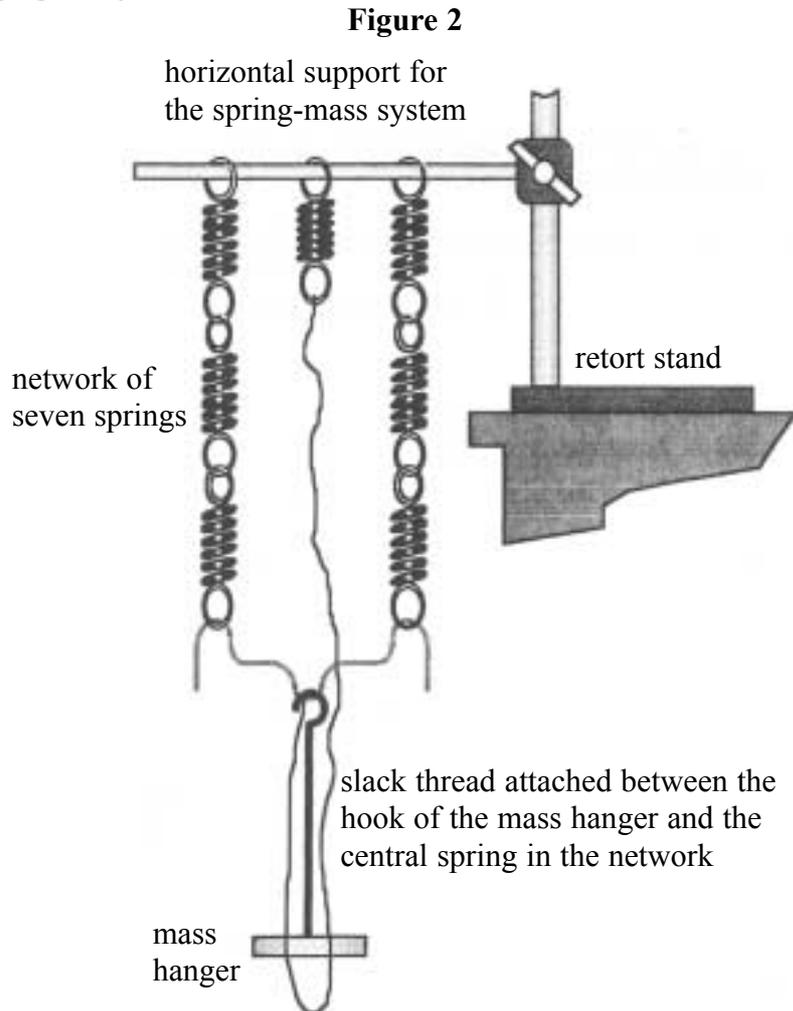
The intention is that the central spring goes into tension as the thread becomes taut when the mass attached to the system is approximately 500 g. Centres should test one set of apparatus to confirm that this is the case and if necessary, adjust the length of the thread accordingly.

- 2 You are to investigate the characteristics of a system consisting of seven springs and a variable mass.

**No description of the experiment is required.**

You are provided with the apparatus shown in **Figure 2**.

Check that the central spring is not under tension and the thread joining this spring to the mass hanger is hanging freely, as shown.



- (a) (i) Record the mass,  $m$ , attached to the spring system.
- (ii) Measure and record the vertical height,  $h$ , between the lower surface of the mass hanger and the floor.
- (b) You are provided with additional slotted masses. Add these masses, in turn, to the mass hanger so that  $m$  increases in several stages until all the masses have been used.  
Make suitable measurements to determine values of  $h$  that correspond to each different value of  $m$ .
- (c) Plot a graph of the measurements made in parts (a) and (b) with  $m$  on the vertical axis and  $h$  on the horizontal axis.

Centres are advised that the graph will have two straight-line regions of negative gradient.